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3 November 1998

AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM TECHNICAL PRESCRIPTIONS FOR WHEELED VEHICLES, EQUIPMENT AND PARTS WHICH CAN BE FITTED AND/OR BE USED ON WHEELED VEHICLES AND THE CONDITIONS FOR RECIPROCAL RECOGNITION OF APPROVALS GRANTED ON THE BASIS OF THESE PRESCRIPTIONS*/

(Revision 2, including the amendments entered into force on 16 October 1995)

Addendum 107: Regulation No. 108

Date of entry into force: 23 June 1998

UNIFORM PROVISIONS CONCERNING THE APPROVAL FOR THE PRODUCTION OF RETREADED PNEUMATIC TYRES FOR MOTOR VEHICLES AND THEIR TRAILERS

UNITED NATIONS

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*/ Former title of the Agreement:

Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958.

GE.98-23779

Regulation No. 108

UNIFORM PROVISIONS CONCERNING THE APPROVAL FOR THE PRODUCTION OF RETREADED PNEUMATIC TYRES FOR MOTOR VEHICLES AND THEIR TRAILERS

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1. SCOPE

This Regulation applies to the production of retreaded tyres intended to be fitted to private (passenger) cars and their trailers used on the road. It does not however apply to:

1.1. Retreaded tyres for commercial vehicles and their trailers.

1.2. Retreaded tyres with a speed capability below 120 km/h or above 240 km/h.

1.3. Tyres for cycles and motorcycles.

1.4. Tyres originally produced without speed symbols and load indices.

1.5. Tyres originally produced without type approval and without either an "E" or "e" mark.

1.6. Tyres designed for the equipment of cars produced prior to 1939.

1.7. Tyres designed exclusively for competition or off road use and marked accordingly.

1.8. Tyres designated as "T type" temporary use spares.

2. DEFINITIONS - See also figure in annex 8

For the purpose of this Regulation:

2.1. "Range of retreaded pneumatic tyres" - means a range of retreaded pneumatic tyres as quoted in paragraph 4.1.4.

2.2. "Structure" of a pneumatic-tyre means the technical characteristics of the tyre's carcass. The following structures are distinguished in particular:

2.2.1. "Diagonal" or "Bias ply" describes a pneumatic-tyre structure in which the ply cords extend to the beads and are laid at alternate angles substantially less than 90° to the centreline of the tread.

2.2.2. "Bias belted" describes a pneumatic-tyre structure of diagonal (bias-ply) type in which the carcass is stabilized by a belt, comprising two or more layers of substantially inextensible cord material laid at alternate angles close to those of the carcass.

2.2.3. "Radial" describes a pneumatic-tyre structure in which the ply cords extend to the beads and are laid substantially at 90° to the centreline of the tread, the carcass being stabilized by an essentially inextensible circumferential belt.

2.3. "Category of use"

2.3.1. Normal tyre is a tyre intended for normal road use only.

2.3.2. Snow tyre is a tyre whose tread pattern, or tread pattern and structure, is primarily designed to ensure, in mud and fresh or melting snow, a performance better than that of a normal tyre. The tread pattern of a snow tyre generally consists of groove (rib) and solid block elements more widely spaced than on a normal tyre.

2.3.3. Temporary use spare tyre is a tyre different from that intended to be fitted to any vehicle for normal driving conditions but intended only for temporary use under restricted driving conditions.

2.3.4. "T" type temporary use spare tyre is a type of temporary use spare tyre designed for use at inflation pressures higher than those established for standard and reinforced tyres.

2.4. "Bead" means the part of a pneumatic-tyre which is of such shape and structure as to fit the rim and hold the tyre on it.

2.5. "Cord" means the strands forming the fabric of the plies in the pneumatic-tyre.

2.6. "Ply" means a layer of "rubber" coated parallel cords.

2.7. "Belt" applies to a radial ply or bias belted tyre and means a layer or layers of material or materials underneath the tread, laid substantially in the direction of the centre line of the tread to restrict the carcass in a circumferential direction.

2.8. "Breaker" applies to a diagonal ply tyre and means an intermediate ply between the carcass and tread.

2.9. "Chafer" means material in the bead area to protect the carcass against chafing or abrasion by the wheel rim.

2.10. "Carcass" means that structural part of a pneumatic-tyre other than the tread and outermost "rubber" of the sidewalls which, when inflated, supports the load.

2.11. "Tread" means that part of a pneumatic-tyre which is designed to come into contact with the ground, protects the carcass against mechanical damage and contributes to ground adhesion.

2.12. "Sidewall" means the part of a pneumatic tyre between the tread and the area designed to be covered by the rim flange.

2.13. "Lower area of tyre" means the area included between the line of maximum section width of the tyre and the area designed to be covered by the edge of the rim.

2.14. "Tread groove" means the space between the adjacent ribs or blocks in the tread pattern.

2.15. "Principal grooves" means the wide grooves situated in the central zone of the tread, which cover approximately three-quarters of the breadth of the tread.

2.16. "Section width" means the linear distance between the outside of the sidewalls of an inflated pneumatic-tyre, when fitted to the specified measuring rim, but excluding elevations due to labelling (marking), decoration or protective bands or ribs.

2.17. "Overall width" means the linear distance between the outside of the sidewalls of an inflated pneumatic-tyre, when fitted to the specified measuring rim, and including labelling (marking), decoration or protective bands or ribs.

2.18. "Section height" means a distance equal to half the difference between the outer diameter of the tyre and the nominal rim diameter.

2.19. "Nominal aspect ratio" means one hundred times the number obtained by dividing the number expressing the nominal section height by the number expressing the nominal section width, both dimensions being in the same units.

2.20. "Outer diameter" means the overall diameter of an inflated, newly retreaded tyre.

2.21. "Tyre size designation" means a designation showing:

2.21.1. The nominal section width. This must be expressed in millimetres, except in cases of tyres for which the size designation is shown in the first column of the tables in annex 5 to this Regulation.

2.21.2. The nominal aspect ratio except in cases of tyres for which the size designation is shown in the first column of the tables in annex 5 to this Regulation.

2.21.3. A conventional number "d" (the "d" symbol) denoting the nominal rim diameter of the rim and corresponding to its diameter expressed either by codes (numbers below 100) or in millimetres (numbers above 100). Numbers corresponding to both types of measurements may be used in the designation.

2.21.3.1. The values of the "d" symbols expressed in millimetres are shown below:

Nominal Rim Diameter Code - "d"	Value of the "d" symbol expressed in mm
8	203
9	229
10	254
11	279
12	305
13	330
14	356
15	381
16	406
17	432
18	457
19	483
20	508
21	533

2.22. "Nominal rim diameter (d)" means the diameter of the rim on which a tyre is designed to be mounted.

2.23. "Rim" means the support, either for a tyre-and-tube assembly or for a tubeless tyre, on which the tyre beads are seated.

2.24. "Measuring rim" means the rim specified as a 'measuring rim width' or 'design rim width' for a particular tyre size designation in any edition of one or more of the International Tyre Standards.

2.25. "Test rim" means any rim specified as approved or recommended or permitted in one of the International Tyre Standards for a tyre of that size designation and type.

2.26. "International Tyre Standard" means any one of the following standard documents:

(a) The European Tyre and Rim Technical Organisation (ETRTO) 1/: 'Standards Manual'
(b) The European Tyre and Rim Technical Organisation (ETRTO) 1/: 'Engineering Design Information - obsolete data'
(c) The Tire and Rim Association Inc. (TRA) 2/: 'Year Book'
(d) The Japan Automobile Tire Manufacturers Association (JATMA) 3/: 'Year Book'
(e) The Tyre and Rim Association of Australia (TRAA) 4/: 'Standards Manual'
(f) The Assiciacao Brasileira de Pneus e Aros (ABPA) 5/: 'Manual de Normal Technicas'
(g) The Scandinavian Tyre and Rim Organisation (STRO) 6/: 'Data Book'

2.27. "Chunking" means the breaking away of pieces of rubber from the tread.

2.28. "Cord separation" means the parting of the cords from their rubber coating.

2.29. "Ply separation" means the parting of adjacent plies.

2.30. "Tread separation" means the pulling away of the tread from the carcass.

2.31. "Tread wear indicators" means the projections within the tread grooves designed to give a visual indication of the degree of wear of the tread.

2.32. "Service description" means the specific combination of the load index and speed symbol of the tyre.

2.33. "Load index" means a numerical code which indicates the maximum load the tyre can support.

The list of load indices and the corresponding loads are shown in annex 4 to this Regulation.

The tyre standards can be obtained from the following addresses:

1/ ETRTO, 32 Av. Brugmann - Bte 2, B-1060 Brussels, Belgium
2/ TRA, 175 Montrose West Avenue, Suite 150, Copley, Ohio, 44321 USA
3/ JATMA, 9th Floor, Toranomon Building No. 1-12, 1-Chome Toranomon Minato-ku, Tokyo 105, Japan
4/ TRAA, Suite 1, Hawthorn House, 795 Glenferrie Road, Hawthorn, Victoria, 3122 Australia
5/ ABPA, Avenida Paulista 244-12° Andar, CEP, 01310 Sao Paulo, SP Brazil
6/ STRO, Älggatan 48 A, Nb, S-216 15 Malmö, Sweden

2.34. "Speed symbol" means:

2.34.1. An alphabetical symbol indicating the speed at which the tyre can carry the load given by the associated load index.

2.34.2. The speed symbols and corresponding speeds are as shown in the table below:

Speed symbol	Corresponding speed (km/h)
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210
V	240

2.35. "Maximum load rating" means the maximum mass which the tyre is rated to support.

2.35.1. For speeds not exceeding 210 km/h, the maximum load rating shall not exceed the value corresponding to the load index for the tyre.

2.35.2. For speeds higher than 210 km/h but not exceeding 240 km/h, (tyres with speed symbol "V"), the maximum load rating shall not exceed the percentage of the value corresponding to the load index of the tyre, indicated in the table below against the speed capability of the vehicle to which the tyre is to be fitted:

Maximum Speed km/h	Load per cent
215	98.5
220	97.0
225	95.5
230	94.0
235	92.5
240	91.0

For intermediate maximum speeds a linear interpolation of the maximum load rating is permissible.

2.36. "Retreading production unit" means a site or group of localized sites where finished retread tyres are produced.

2.37. "Retreading" means the generic term for reconditioning a used tyre by replacing the worn tread with new material. It may also include renovation of the outermost sidewall surface. It covers the following process methods:

2.37.1. "Top capping" - replacement of the tread.

2.37.2. "Re-capping" - replacement of the tread and with the new material extending over part of the sidewall.

2.37.3. "Bead to bead" - replacement of the tread and renovation of the sidewall including all or part of the lower area of the tyre.

2.38. "Casing" is the worn tyre comprising carcass and remaining tread and sidewall material.

2.39. "Buffing" is the process of removing old material from the casing to prepare the surface for the new material.

2.40. "Repair" is the remedial work carried out to damaged casings within recognized limits.

2.41. "Tread material" is material in a condition suitable for replacing the worn tread. It can be in several forms for example:

2.41.1. "Camel-back" - pre-cut lengths of material which have been extruded to give the required cross section profile and subsequently fitted cold to the prepared casing. The new material must be cured.

2.41.2. "Strip-wound" - a ribbon of tread material which is directly extruded and wound on to the prepared casing and built up to the required cross sectional contour. The new material must be cured.

2.41.3. "Direct extrusion" - tread material extruded to give the required cross sectional profile and directly extruded on to the prepared casing. The new material must be cured.

2.41.4. "Pre-cured" - a previously formed and cured tread applied directly to the prepared casing. The new material must be bonded to the casing.

2.42. "Sidewall veneer" is material used to cover the sidewalls of the casing thereby allowing the required markings to be formed.

2.43. "Cushion gum" is material used as a bonding layer between new tread and casing and for repairing minor damage.

2.44. "Cement" is an adhesive solution to hold new materials in place prior to the curing process.

2.45. "Cure" is the term used to describe the change in physical properties of the new material which is brought about usually by the application of heat and pressure for a set period of time under controlled conditions.

2.46. "Radial run out" means the variation in radius of the tyre measured around the outer circumference of the tread surface.

2.47. "Imbalance" means a measurement of the variation in distribution of mass around the centre axis of the tyre. It can be measured as either "Static" or "Dynamic" imbalance.

3. MARKINGS

3.1. An example of the arrangement of retreaded tyre markings is shown in annex 3 to this Regulation.

3.2. Retreaded tyres shall display on both sidewalls in the case of symmetrical tyres and at least on the outer sidewall in the case of asymmetrical tyres:

3.2.1. The brand name or trade mark.

3.2.2. The tyre-size designation as defined in paragraph 2.21.

3.2.3. An indication of the structure as follows:

3.2.3.1. On diagonal (bias-ply) tyres; no indication, or the letter "D" placed in front of the rim diameter marking.

3.2.3.2. On radial-ply tyres; the letter "R" placed in front of the rim-diameter marking and optionally the word "RADIAL".

3.2.3.3. On bias belted tyres; the letter "B" placed in front of the rim diameter marking and in addition the words "BIAS-BELTED".

3.2.4. The service description comprising:

3.2.4.1. An indication of the tyre's nominal load capacity in the form of the load index prescribed in paragraph 2.33.

3.2.4.2. An indication of the tyre's nominal speed capability in the form of the symbol prescribed in paragraph 2.34.

3.2.5. The word "TUBELESS" if the tyre is designed for use without an inner tube.

3.2.6. The inscription M+S or MS or M.S. or M & S in the case of a snow tyre.

3.2.7. The date of retreading as follows:

3.2.7.1. Up to 31 December 1999: either as prescribed in paragraph 3.2.7.2. or in the form of a group of three digits, the first two showing the week number and the third, the year of the decade of manufacture. The date code can cover a period of production from the week indicated by the week number up to and including the week number plus three. For example, the marking "253" could indicate a tyre which was retreaded in weeks 25, 26, 27 or 28 of the year 1993.

The date code may be marked on one sidewall only.

3.2.7.2. As from 1 January 2000: in the form of a group of four digits, the first two showing the week number and the second two showing the year in which the tyre was retreaded. The date code can cover a period of production from the week indicated by the week number up to and including the week number plus three. For example, the marking "2503" could indicate a tyre which was retreaded in weeks 25, 26, 27 or 28 of the year 2003.

The date code may be marked on one sidewall only.

3.2.8. The term "RETREAD" or "REMOULD" (after 1 January 1999 only the word "RETREAD" shall be used). At the request of the retreader, the same term in other languages may also be added.

3.3. Prior to approval tyres shall exhibit a free space sufficiently large to accommodate an approval mark as referred to in paragraph 5.8. and as shown in annex 2 to this Regulation.

3.4. Following approval, the markings referred to in paragraph 5.8. and as shown in annex 2 to this Regulation shall be affixed in the free space referred to in paragraph 3.3. This marking may be affixed to one sidewall only.

3.5. The markings referred to in paragraph 3.2. and the approval mark prescribed in paragraphs 3.4. and 5.8. shall be clearly legible and shall be moulded on to or into the tyre or shall be permanently marked on to the tyre.

3.6. As far as any of the original manufacturer's specifications are still legible after the tyres have been retreaded, they shall be regarded as specifications of the retreader for the retreaded tyre. If these original specifications do not apply after retreading they shall be completely removed.

3.7. The original "E" or "e" approval mark and number shall be removed.

4. APPLICATION FOR APPROVAL

The following procedures are applicable to the approval of a tyre retreading production unit.

4.1. The application for approval of a retreading production unit shall be submitted by the holder of the trade name or trade mark to be applied to the tyre or by his duly accredited representative. It shall specify:

4.1.1. An outline of the structure of the company producing the retreaded tyres.

4.1.2. A brief description of the quality management system, which ensures the effective control of the tyre retreading procedures to meet the requirements of this Regulation.

4.1.3. The trade names or marks to be applied to the retreaded tyres produced.

4.1.4. The following information in relation to the range of tyres to be retreaded:

4.1.4.1. the range of tyre sizes;

4.1.4.2. the structure of tyres (diagonal or bias ply, bias-belted or radial);

4.1.4.3. the category of use of tyres (normal or snow tyres etc.);

4.1.4.4. the system of retreading and the method of application of the new materials to be used, as defined in paragraphs 2.37. and 2.41.;

4.1.4.5. the maximum speed symbol of the tyres to be retreaded;

4.1.4.6. the maximum load index of the tyres to be retreaded.

4.1.4.7. the nominated International Tyre Standard to which the range of tyres conform.

5. APPROVAL

5.1. To retread tyres requires the approval of the retreading production unit by the responsible authorities in accordance with the requirements of this Regulation. The responsible authority takes the necessary measures as described in this Regulation in order to ensure that the tyres retreaded in the respective production unit will meet with the requirements stated in this Regulation. The retread production unit shall be fully responsible for ensuring that the retreaded tyres will meet the requirements of this Regulation and that they will perform adequately in normal use.

5.2. In addition to the normal requirements for the initial assessment of the tyre retreading production unit, the approval authority shall be satisfied that the procedures, operation, instructions and specification documentation provided by material suppliers are in a language readily understood by the tyre retreading production unit operatives.

5.3. The approval authority shall ensure that the procedures and operations documentation for each production unit contains specifications, appropriate to the repair materials and processes used, of the limits of repairable damage or penetrations to the tyre carcass, whether such damage is existing or is caused during the processes of preparation for retreading.

5.4. Before granting approval the authority must be satisfied that retreaded tyres conform to this Regulation and that the tests prescribed in paragraphs 6.7. and 6.8. have been successfully carried out on at least 5 and not necessarily more than 20 samples of retreaded tyres representative of the range of tyres produced by the retreading production unit.

5.5. In the case of each failure being recorded during tests, two further samples of the same specification tyre shall be tested.
If either or both of these second two samples fail, then a final submission of two samples shall be tested.
If either or both of the final two samples fail, then the application for approval of the retreading production unit shall be rejected.

5.6. If all the requirements of this Regulation are met, then approval shall be granted and an approval number shall be assigned to each retreading production unit approved. The first two digits of this number shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The approval number shall be preceded by "108R" signifying that the approval applies to a tyre retreaded as prescribed in this Regulation. The same authority shall not assign the same number to another production unit covered by this Regulation.

5.7. Notice of approval or of extension, refusal or withdrawal of approval or of production definitely discontinued pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement applying this Regulation, by means of a form conforming to the model in annex 1 to this Regulation.

5.8. There shall be affixed conspicuously to every retreaded tyre conforming to this Regulation, in the space referred to in paragraph 3.3. and in addition to the markings prescribed in paragraph 3.2., an international approval mark consisting of:

5.8.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which granted approval 1/; and

5.8.2. An approval number as described in paragraph 5.6.

5.9. Annex 2 to this Regulation gives an example of the arrangements of the approval mark.

6. REQUIREMENTS

6.1. Tyres shall not be accepted for retreading unless they have been type approved and bear either an "E" or "e" mark, except that this requirement shall not be mandatory until 1 January 2000 at the latest.

6.2. Tyres which have been previously retreaded shall not be accepted for further retreading.

1/ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32-36 (vacant), 37 for Turkey, 38-39 (vacant), 40 for The former Yugoslav Republic of Macedonia, 41 (vacant), 42 for the European Community (Approvals are granted by its Member States using their respective ECE symbol) and 43 for Japan. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

6.3. The age of the casing accepted for retreading shall not exceed 7 years, based on the digits showing the year of manufacture of the original tyre; e.g. the tyre marked with a date code "253" can be accepted for retreading till the end of the year 2000.

6.4. Conditions before retreading:

6.4.1. Tyres shall be clean and dry before inspection.

6.4.2. Before buffing, each tyre shall be thoroughly examined both internally and externally to ensure its suitability for retreading.

6.4.3. Tyres where damage is visible which has resulted from overload or underinflation shall not be retreaded.

6.4.4. Tyres showing any of the following damage shall not be accepted for retreading:

6.4.4.1.
(a) extensive cracking extending through to the carcass;
(b) carcass penetrations or damage to casings above "H" speed symbol except where these casings are to be downrated to a lower speed symbol;
(c) previous repairs to damage outside specified injury limits - see paragraph 5.3.;
(d) carcass break up;
(e) appreciable oil or chemical attack;
(f) multiple damage too close together;
(g) damaged or broken bead;
(h) non repairable deterioration of or damage to inner liner;
(i) bead damage other than minor "rubber" only damage;
(j) exposed cords due to tread wear or sidewall scuffing;
(k) non-repairable tread or sidewall material separation from the carcass;
(l) structural damage in the area of the sidewall.

6.4.5. Radial ply tyre carcasses with separation in the belt, other than slight belt edge looseness, shall not be accepted for retreading.

6.5. Preparation:

6.5.1. After buffing, and before the application of new material, each tyre shall be thoroughly re-examined at least externally to ensure its continued suitability for retreading.

6.5.2. The entire surface to which new material is to be applied shall have been prepared without overheating. The buffed surface texture shall not contain deep buffing lacerations or loose material.

6.5.3. Where precured material is to be used the contours of the prepared area shall meet the requirements of the material manufacturer.

6.5.4. Loose cord ends are not permissible.

6.5.5. Casing cords shall not be damaged during the preparation process.

6.5.6. Buffing damage to the belt of radial tyres shall be limited to localised damage to the outermost layer only.

6.5.7. Buffing damage limits for diagonal ply tyres shall be as follows:

6.5.7.1. For two ply construction, there shall not be any damage to the carcass except for slight localised buffing damage to the casing joint.

6.5.7.2. For two ply plus breaker construction of tubeless type tyres, there shall not be any damage to the carcass or breaker.

6.5.7.3. For two ply plus breaker construction of tube type tyres, localised damage to the breaker is permissible.

6.5.7.4. For four ply, or more, construction of tubeless type tyres, there shall not be any damage to the carcass or breaker.

6.5.7.5. For four ply, or more, construction of tube type tyres, damage shall be limited to the outermost ply in the crown area only.

6.5.8. Exposed steel parts shall be treated as soon as possible with appropriate material as defined by the manufacturer of that appropriate material.

6.6. Retreading:

6.6.1. The retreader must ensure that either the manufacturer or the supplier of repair materials, including patches, is responsible for the following:

(a) defining method(s) of application and storage, if requested by the retreader, in the national language of the country in which the materials are to be used;

(b) defining limits of damage for which the materials are designed, if requested by the retreader, in the national language of the country in which the materials are to be used;

(c) ensuring that reinforced patches for tyres, if correctly applied in carcass repairs, are suitable for the purpose;

(d) ensuring that the patches are capable of withstanding twice the maximum inflation pressure as given by the tyre manufacturer;

(e) ensuring the suitability of any other repair materials for the service intended.

6.6.2. The retreader shall be responsible for the correct application of the repair material and for ensuring that the repair is free from any defects which may affect the satisfactory service life of the tyre.

6.6.3. The retreader shall ensure that either the manufacturer or the supplier of tread and sidewall material issues specifications concerning the conditions of storage and use of the material in order to guarantee the material's qualities. If requested by the retreader, this information shall be in the national language of the country in which the materials are to be used.

6.6.4. The retreader must ensure that the repair material and/or compound is documented in a manufacturer's or supplier's certificate. The material compound must be suitable for the intended use of the tyre.

6.6.5. The processed tyre shall be cured as soon as possible after the completion of all repairs and building-up operations and at the latest according to the material manufacturer's specifications.

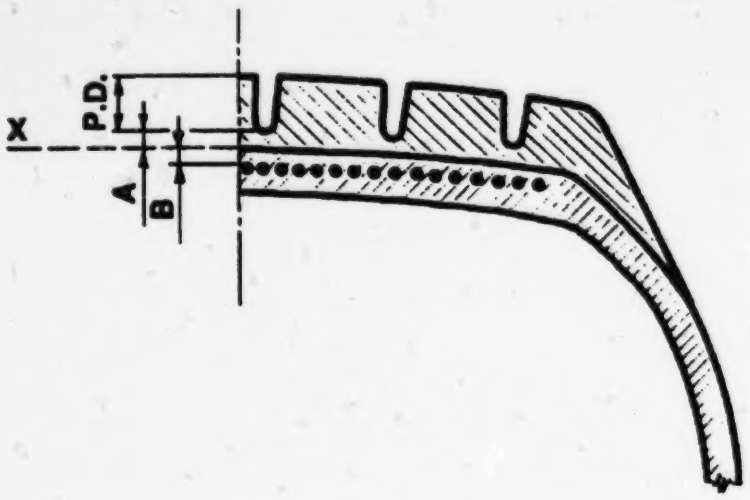
6.6.6. The tyre shall be cured for the length of time and at the temperature and pressure, appropriate to, and specified for, the materials and processing equipment used.

6.6.7. The dimensions of the mould shall be appropriate to the thickness of the new material and the size of the buffed casing. Radial ply tyres, when moulded, shall be cured in radial or radially divided moulds only.

6.6.8. The thickness of original material after buffing and the average thickness of any new material under the tread pattern after retreading shall be as given in paragraphs 6.6.8.1. and 6.6.8.2. The thickness of material at any point either across the breadth of the tread or around the circumference of the tyre shall be controlled in such a way that the provisions of paragraphs 6.7.5. and 6.7.6. are met.

6.6.8.1. For radial ply and bias belted tyres (mm):

$1.5 \leq (A+B) \leq 5$	(minimum 1.5 mm; maximum 5.0 mm)
$A \geq 1$	(minimum 1.0 mm)
$B \geq 0.5$	(minimum 0.5 mm)



P.D. = Pattern depth
X = Buff line
A = Average thickness of new material under pattern
B = Minimum thickness of original material above belt after buffing

6.6.8.2. For diagonal (Bias-ply) tyres:

The thickness of original material above the breaker shall be ≥ 0.00 mm.

The average thickness of new material above the buffed casing line shall be ≥ 2.00 mm.

The combined thickness of original and new material beneath the base of the grooves of the tread pattern shall be ≥ 2.00 and ≤ 5.00 mm.

6.6.9. The service description of a retreaded tyre shall not show either a higher speed symbol or a higher load index than that of the original, first life, tyre.

6.6.10. The minimum speed capability of a retreaded tyre shall be 120 km/h ("L" speed symbol) and the maximum shall be 240 km/h ("V" speed symbol).

6.6.11. Tread wear indicators shall be incorporated as follows:

6.6.11.1. The retreaded pneumatic tyre shall include not less than six transverse rows of wear indicators, approximately equi-spaced and situated in the principal grooves of the tread. The tread wear indicators shall be such that they cannot be confused with the material ridges between the ribs or blocks of the tread.

6.6.11.2. However, in the case of tyres designed for mounting on rims of a nominal diameter of code 12 or less, four rows of tread wear indicators are permissible.

6.6.11.3. The tread wear indicators shall provide a means of indicating, with a tolerance of +0.60/-0.00 mm, when the tread grooves are no longer more than 1.6 mm deep.

6.6.11.4. The height of the tread wear indicators shall be determined by measuring the difference between the depth from the tread surface to the top of the tread wear indicators and the base of the tread grooves, close to the slope at the base of the tread wear indicators.

6.7. Inspection:

6.7.1. After curing, whilst a degree of heat is retained in a tyre, each retreaded tyre shall be examined to ensure that it is free from any apparent defects. During or after retreading the tyre must be inflated to at least 1.5 bar for examination. Where there is any apparent defect in the profile of the tyre (e.g. blister, depression, etc.) the tyre shall be specifically examined to determine the cause of this defect.

6.7.2. Before, during or after retreading the tyre shall be checked at least once for the integrity of its structure by means of a suitable inspection method.

6.7.3. For the purposes of quality control a number of retreaded tyres shall be subjected to destructive and/or non-destructive testing or examination. The quantity of tyres checked and the results shall be recorded.

6.7.4. After retreading, the dimensions of the retreaded tyre, when measured in accordance with annex 6 to this Regulation, must conform either to dimensions calculated according to the procedures in paragraph 7 or to annex 5 to this Regulation.

6.7.5. The radial run out of the retreaded tyre shall not exceed 1.5 mm (+0.4 mm measuring tolerance).

6.7.6. The maximum static imbalance of the retreaded tyre, measured at the rim diameter, shall not exceed 1.5 per cent of the mass of the tyre.

6.7.7. Tread wear indicators shall conform to the requirements of paragraph 6.6.11.

6.8. Performance test:

6.8.1. Tyres retreaded to comply with this Regulation shall be capable of meeting the load/speed endurance test as specified in annex 7 to this Regulation.

6.8.2. A retreaded tyre which after undergoing the load/speed endurance test does not exhibit any tread separation, ply separation, cord separation, chunking or broken cords shall be deemed to have passed the test.

6.8.3. The outer diameter of the tyre, measured six hours after the load/speed endurance test, must not differ by more than ± 3.5 per cent from the outer diameter as measured before the test.

7. SPECIFICATIONS

7.1. Tyres retreaded to comply with this Regulation shall conform to the following dimensions:

7.1.1. Section width:

7.1.1.1. The section width shall be calculated by the following formula:

$$S = S_1 + K\ (A - A_1)$$

where:

S : is the actual section width in millimetres as measured on the test rim;

S_1: is the value of the 'Design Section Width', referred to the measuring rim, as quoted in the International Tyre Standard specified by the retreader for the tyre size in question;

A : is the width of the test rim in millimetres;

A_1: is the width in millimetres of the measuring rim as quoted in the International Tyre Standard specified by the retreader for the tyre size in question.

K: is a factor and shall be taken to equal 0.4.

7.1.2. Outer diameter:

7.1.2.1. The theoretical outer diameter of a retreaded tyre shall be calculated by the following formula:

$D = d + 2H$

where:

D: is the theoretical outer diameter in millimetres;

d: is the conventional number defined in paragraph 2.21.3., in millimetres;

H: is nominal section height in millimetres and is equal to S_n multiplied by 0.01 Ra where:

S_n: is the nominal section width in millimetres;

Ra: is the nominal aspect ratio

All of the above symbols are as quoted in the tyre size designation as shown on the sidewall of the tyre in conformity with the requirements of paragraph 3.2.2. and as defined in paragraph 2.21.

7.1.2.2. However, for tyres whose designation is given in the first column of the tables in annex 5 to ECE Regulation No. 30, the outer diameter shall be that given in those tables.

7.1.3. Method of measuring retreaded tyres:

7.1.3.1. The dimensions of retreaded tyres shall be measured in accordance with the procedures given in annex 6 to this Regulation.

7.1.4. Section width specifications:

7.1.4.1. The actual overall width may be less than the section width or widths determined in paragraph 7.1.

7.1.4.2. The actual overall width may also exceed the value or values determined in paragraph 7.1. by:

7.1.4.2.1. 4 per cent in the case of radial ply tyres and

7.1.4.2.2. 6 per cent in the case of diagonal (bias-ply) or bias belted tyres.

7.1.4.2.3. in addition, if the tyre has a special protective band, the width may be greater by up to 8 mm above the tolerances given by paragraphs 7.1.4.2.1. and 7.1.4.2.2.

7.1.5. Outer diameter specifications:

7.1.5.1. The actual outer diameter of a retreaded tyre must not be outside the values of Dmin and Dmax obtained by the following formulae:

Dmin = d + (2H x a)

Dmax = d + (2H x b)

where:

7.1.5.1.1. For sizes not given in the tables in annex 5 to this Regulation, "H" and "d" are as defined in paragraph 7.1.2.1.

7.1.5.1.2. For sizes mentioned in paragraph 7.1.2.2. above:

$$H = 0.5 (D - d)$$

where "D" is the outer diameter and "d" the Nominal rim diameter quoted in the above-mentioned tables for the size in question.

7.1.5.1.3. The coefficient "a" = 0.97

7.1.5.1.4. The coefficient "b" is:

	Radial tyres	Diagonal (bias-ply) and bias belted tyres
for normal use tyres	1.04	1.08

7.1.5.2. For snow tyres the maximum outer diameter (Dmax) calculated in paragraph 7.1.5.1. may be exceeded by not more than 1 per cent.

8. MODIFICATIONS TO THE APPROVAL

8.1. Every modification concerning a retreading production unit amending any of the information given by the retreading production unit in the Application for Approval, see paragraph 4, shall be notified to the approval authority which approved the retreading production unit. That authority may then either:

8.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the retreading production unit still meets the requirements; or

8.1.2. Require a further investigation of the approval.

8.2. Confirmation of, or refusal of, approval, specifying the modifications, shall be communicated by the procedure specified in paragraph 5.7. to the Parties to the Agreement which apply this Regulation.

9. CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the Agreement, Appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.2), with the following requirements.

9.1. The retreading production unit approved according to this Regulation shall conform to the requirements set out in paragraph 6.

9.2. The holder of the approval shall ensure that, during each year of production, and spread throughout that year, at least the following number of tyres, representative of the range being produced, is checked and tested as prescribed in this Regulation:

9.2.1. 0.01 per cent of the total annual production but in any case not less than 5 and not necessarily more than 20.

9.3. If the requirements of paragraph 9.2. are carried out by or under the control of the approval authority, the results may be used as part of, or instead of, those prescribed in paragraph 9.4.

9.4. The authority which has approved the retreading production unit may at any time verify the conformity control methods applied in each production facility. For each production facility the type approval authority shall take samples at random during each and every production year and at least the following number of tyres, representative of the range being produced, shall be checked and tested as prescribed in this Regulation:

9.4.1. 0.01 per cent of the total annual production but in any case not less than 5 and not necessarily more than 20.

9.5. The tests and checks of paragraph 9.4. may replace those required in paragraph 9.2.

10. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

10.1. The approval granted in respect of a retreading production unit pursuant to this Regulation may be withdrawn if the requirements of paragraph 9 are not complied with or if the retreading production unit or the retreaded tyres produced by that retreading production unit have failed to meet the requirements prescribed in that paragraph.

10.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties to the 1958 Agreement applying this Regulation, by means of a communication form conforming to the model shown in annex 1 to this Regulation.

11. PRODUCTION DEFINITELY DISCONTINUED

The authority which granted the approval of the retreading production unit shall be informed if operations and manufacture of retreaded tyres approved within the scope of this Regulation cease. On receipt of this information the authority shall communicate this information to the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model shown in annex 1 to this Regulation.

12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, OF TEST LABORATORIES, AND OF ADMINISTRATIVE DEPARTMENTS

12.1. The Parties to the 1958 Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and, where applicable, of the approved test laboratories and of the administrative departments which grant approval and to which forms certifying approval or refusal or withdrawal of approval, issued in other countries, are to be sent.

12.2. The Parties to the 1958 Agreement which apply this Regulation may use laboratories of tyre manufacturers or retreading production units and may designate, as approved test laboratories, those which are situated either in the territory of that Party or in the territory of another Party to the 1958 Agreement subject to a preliminary acceptance of this procedure by the competent administrative department of the latter.

12.3. Where a Party to the 1958 Agreement applies paragraph 12.2., it may, if it desires, be represented at the tests.

Annex 1

COMMUNICATION

(maximum format: A4 (210 x 297 mm))

issued by: Name of administration:
.....
.....
.....

concerning: 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a retreading production unit pursuant to Regulation No. 108

Approval No.: ..... Extension No.:.....

1. Retreader's name or trade mark: . . . . . .

2. Name and address of retreading production unit: . . . . . .
. . . . . .

3. If applicable, name and address of retreader's representative: . . . .
. . . . . .

4. Summarized description as in paragraphs 4.1.3. and 4.1.4. of this Regulation: . . . . . .

5. Technical service and, where applicable, test laboratory approved for purposes of approval or verification of conformity: . . . . . .
. . . . . .

6. Date of report issued by that service: . . . . . .

7. Number of report issued by that service: . . . . . .

8. Reason(s) of extension (if applicable): . . . . . .

9. Any remarks: . . . . . .

10. Place: . . . . . .

11. Date: . . . . . .

12. Signature . . . . . .

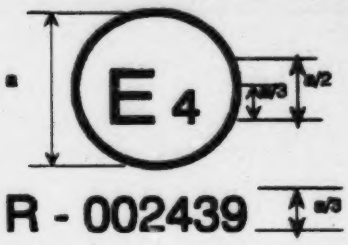
13. Annexed to this communication is a list of documents in the approval file deposited at the Approval Authority which has considered this approval and which can be obtained upon request.

1/ Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).

2/ Delete that which does not apply.

Annex 2

ARRANGEMENT OF APPROVAL MARK



a = 12 mm min

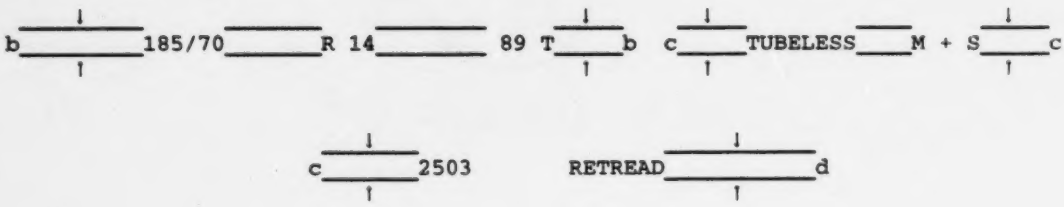
The above approval mark affixed to a retreaded tyre shows that the retreading production unit concerned has been approved in the Netherlands (E4) under approval number 108R002439, meeting the requirements of this Regulation in its original form (00).

The approval number must be placed close to the circle and either above or below the "E" or left or right of that letter. The digits of the approval number must be on the same side of the "E" and face in the same direction. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

Annex 3

ARRANGEMENT OF RETREAD TYRE MARKINGS

Example of the markings to be borne by retreaded tyres placed on the market after the entry into force of this Regulation



b : 6 mm (min.)
c : 4 mm (min.)
d : 3 mm (min.)
and from 1998, 4 mm (min.)

These markings define a retreaded tyre:

having a nominal section width of 185;

having a nominal aspect ratio of 70;

of radial-ply structure (R);

having a nominal rim diameter of code 14;

having a service description "89T" indicating a load capacity of 580 kg corresponding to a load index of "89" and a maximum speed capability of 190 km/h corresponding to a speed symbol "T";

for fitting without an inner tube ("TUBELESS");

of snow type (M+S);

retreaded in the weeks 25, 26, 27 or 28 of the year 2003.

The positioning and order of the markings constituting the tyre designation shall be as follows:

(a) the size designation, comprising the nominal section width, the nominal aspect ratio, the type-of-structure symbol (where applicable) and the nominal rim diameter shall be grouped as shown in the above example: 185/70 R 14;

(b) the service description comprising the load index and the speed symbol shall be placed near the size designation. It may either precede the size designation or follow it or be placed above or below it;

(c) the symbols "TUBELESS", "REINFORCED", and "M + S" may be at a distance from the size designation.

(d) the word "RETREAD" may be at a distance from the size designation.

Annex 4

LIST OF LOAD INDICES AND CORRESPONDING LOAD CAPACITIES

Load index (LI) and load capacity - kg													
LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg
0	45	40	140	80	450	120	1 400	160	4 500	200	14 000	240	45 000
1	46.2	41	145	81	462	121	1 450	161	4 625	201	14 500	241	46 250
2	47.5	42	150	82	475	122	1 500	162	4 750	202	15 000	242	47 500
3	48.7	43	155	83	487	123	1 550	163	4 875	203	15 500	243	48 750
4	50	44	160	84	500	124	1 600	164	5 000	204	16 000	244	50 000
5	51.5	45	165	85	515	125	1 650	165	5 150	205	16 500	245	51 500
6	53	46	170	86	530	126	1 700	166	5 300	206	17 000	246	53 000
7	54.5	47	175	87	545	127	1 750	167	5 450	207	17 500	247	54 500
8	56	48	180	88	560	128	1 800	168	5 600	208	18 000	248	56 000
9	58	49	185	89	580	129	1 850	169	5 800	209	18 500	249	58 000
10	60	50	190	90	600	130	1 900	170	6 000	210	19 000	250	60 000
11	61.5	51	195	91	615	131	1 950	171	6 150	211	19 500	251	61 500
12	63	52	200	92	630	132	2 000	172	6 300	212	20 000	252	63 000
13	65	53	206	93	650	133	2 060	173	6 500	213	20 600	253	65 000
14	67	54	212	94	670	134	2 120	174	6 700	214	21 200	254	67 000
15	69	55	218	95	690	135	2 180	175	6 900	215	21 800	255	69 000
16	71	56	224	96	710	136	2 240	176	7 100	216	22 400	256	71 000
17	73	57	230	97	730	137	2 300	177	7 300	217	23 000	257	73 000
18	75	58	236	98	750	138	2 360	178	7 500	218	23 600	258	75 000
19	77.5	59	243	99	775	139	2 430	179	7 750	219	24 300	259	77 500
20	80	60	250	100	800	140	2 500	180	8 000	220	25 000	260	80 000
21	82.5	61	257	101	825	141	2 575	181	8 250	221	25 750	261	82 500
22	85	62	265	102	850	142	2 650	182	8 500	222	26 500	262	85 000
23	87.5	63	272	103	875	143	2 725	183	8 750	223	27 250	263	87 500
24	90	64	280	104	900	144	2 800	184	9 000	224	28 000	264	90 000
25	92.5	65	290	105	925	145	2 900	185	9 250	225	29 000	265	92 500
26	95	66	300	106	950	146	3 000	186	9 500	226	30 000	266	95 000
27	97.5	67	307	107	975	147	3 075	187	9 750	227	30 750	267	97 500
28	100	68	315	108	1 000	148	3 150	188	10 000	228	31 500	268	100 000
29	103	69	325	109	1 030	149	3 250	189	10 300	229	32 500	269	103 000
30	106	70	335	110	1 060	150	3 350	190	10 600	230	33 500	270	106 000
31	109	71	345	111	1 090	151	3 450	191	10 900	231	34 500	271	109 000
32	112	72	355	112	1 120	152	3 550	192	11 200	232	35 500	272	112 000
33	115	73	365	113	1 150	153	3 650	193	11 500	233	36 500	273	115 000
34	118	74	375	114	1 180	154	3 750	194	11 800	234	37 500	274	118 000
35	121	75	387	115	1 215	155	3 875	195	12 150	235	38 750	275	121 500
36	125	76	400	116	1 250	156	4 000	196	12 500	236	40 000	276	125 000
37	128	77	412	117	1 285	157	4 125	197	12 850	237	41 250	277	128 500
38	132	78	425	118	1 320	158	4 250	198	13 200	238	42 500	278	132 000
39	136	79	437	119	1 360	159	4 375	199	13 600	239	43 750	279	136 000

Annex 5

TYRE SIZE DESIGNATION AND DIMENSIONS

(IN ACCORDANCE WITH ECE REGULATION No. 30)

FOR THIS INFORMATION REFER TO ANNEX 5 OF ECE REGULATION No. 30

Annex 6

METHOD OF MEASURING PNEUMATIC TYRES

1. Preparing the tyre

1.1. The tyre shall be mounted on the test rim specified by the retreader and inflated to the pressure of 3 to 3.5 bar.

1.2. The tyre pressure shall be adjusted as follows:

1.2.1. for standard bias belted tyres - to 1.7 bar;

1.2.2 for diagonal (bias ply) tyres - to:

	Pressure (bar) for Speed symbol		
Ply rating	L, M, N	P, Q, R, S	T, U, H, V
4	1.7	2.0	-
6	2.1	2.4	2.6
8	2.5	2.8	3.0

1.2.3. for standard radial tyres - to 1.8 bar;

1.2.4. for reinforced tyres - to 2.3 bar.

2. Measuring procedure

2.1. The tyre, mounted on its rim, shall be conditioned at the ambient room temperature for not less than 24 hr, save as otherwise required by paragraph 6.8.3. of this Regulation.

2.2. The tyre pressure shall be readjusted to the level specified in paragraph 1.2. of this annex.

2.3. The overall width shall be measured at six equally spaced points around the tyre, taking account of the thickness of any protective ribs or bands. The highest reading obtained shall be taken as the overall width.

2.4. The outer diameter shall be calculated from a measurement of the maximum circumference of the inflated tyre.

Annex 7

PROCEDURE FOR LOAD/SPEED ENDURANCE TESTS (IN PRINCIPLE IN ACCORDANCE WITH ANNEX 7 OF REGULATION No. 30)

1. Preparing the tyre

1.1. Mount a retreaded tyre on the test rim specified by the retreader.

1.2. Inflate the tyre to the appropriate pressure as given (in bar) in the table below:

Speed Category	Diagonal (bias-ply) tyres			Radial Tyres		Bias-belted tyres
	Ply-rating			Standard	Reinforced	Standard
	4	6	8			
L, M, N	2.3	2.7	3.0	2.4	-	-
P, Q, R, S	2.6	3.0	3.3	2.6	3.0	2.6
T, U, H	2.8	3.2	3.5	2.8	3.2	2.8
V	3.0	3.4	3.7	3.0	3.4	-

1.3. The retreading production unit may request, giving reasons, the use of a test inflation pressure different from those given in paragraph 1.2. of this annex. In this case the tyre shall be inflated to the requested pressure.

1.4. Condition the tyre and wheel assembly at test-room temperature for not less than three hours.

1.5. Readjust the tyre pressure to that specified in paragraph 1.2. or 1.3. of this annex.

2. Test procedure

2.1. Mount the tyre and wheel assembly on a test axle and press it against the outer face of a smooth surfaced power driven test drum either 1.70 m ± 1 per cent or 2.00 m ± 1 per cent diameter.

2.2. Apply to the test axle a load equal to 80 per cent of:

2.2.1. the maximum load rating corresponding to the Load Index for tyres with Speed Symbols L to H inclusive,

2.2.2. the maximum load rating associated with a maximum speed of 240 km/h for tyres of Speed Symbol "V" (see paragraph 2.32. of this Regulation).

2.3. Throughout the test the tyre pressure must not be corrected and the test load must be kept constant.

2.4. During the test the temperature in the test-room must be maintained at between 20° and 30°C unless the tyre manufacturer or retreader agrees to a higher temperature.

2.5. The endurance test programme shall be carried out without interruption and shall be as follows:

2.5.1 time taken from zero speed to initial test speed: 10 minutes;

2.5.2. initial test speed: prescribed maximum speed for the tyre concerned, less 40 km/h in the case of a test drum of 1.70 m ± 1 per cent diameter or less 30 km/h in the case of a test drum of 2.00m ± 1 per cent diameter;

2.5.3. successive speed increments: 10 km/h up to the maximum test speed;

2.5.4. duration of test at each speed step except the last: 10 minutes;

2.5.5. duration of test at last speed step: 20 minutes;

2.5.6. maximum test speed: prescribed maximum speed for the tyre concerned, less 10 km/h in the case of a test drum of 1.70 m ± 1 per cent diameter or the prescribed maximum speed in the case of a test drum of 2.00 m ± 1 per cent diameter.

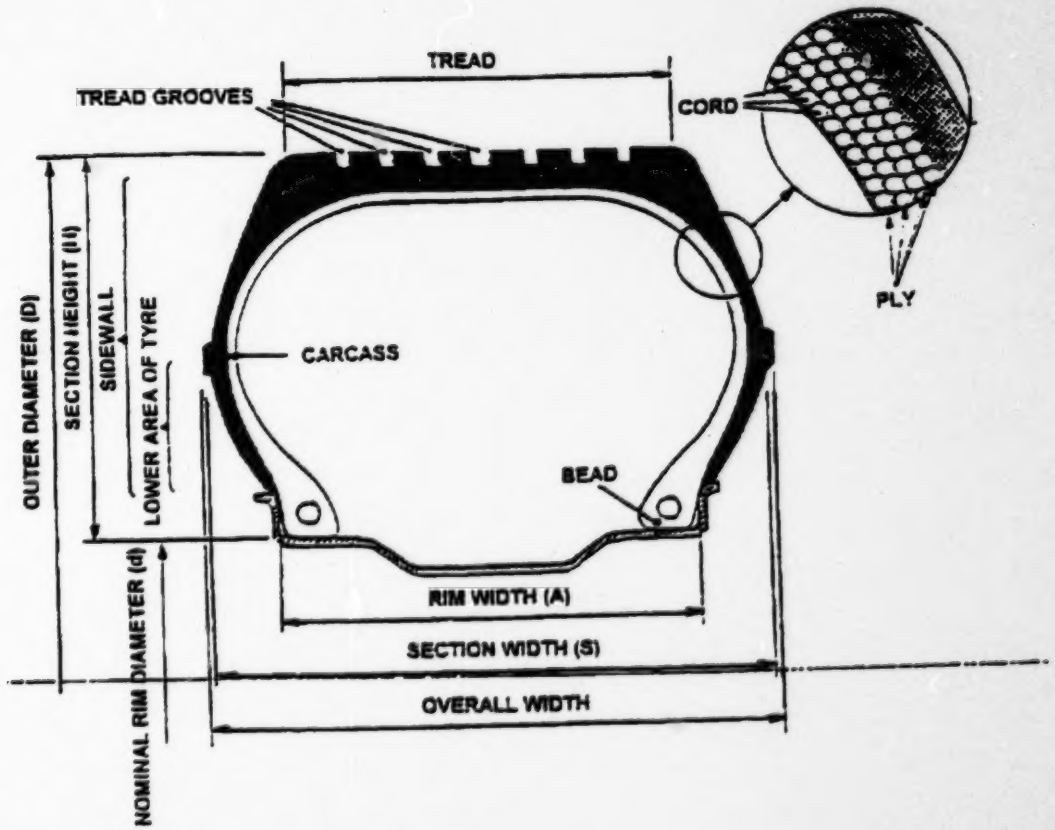
3. Equivalent test methods

If a method other than that described in paragraph 2 of this annex is used, its equivalence must be demonstrated.

Annex 8

EXPLANATORY FIGURE

See paragraph 2 of this Regulation



E/ECE/324
E/ECE/TRANS/505 } Rev.2/Add.108

3 November 1998

AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM TECHNICAL PRESCRIPTIONS FOR WHEELED VEHICLES, EQUIPMENT AND PARTS WHICH CAN BE FITTED AND/OR BE USED ON WHEELED VEHICLES AND THE CONDITIONS FOR RECIPROCAL RECOGNITION OF APPROVALS GRANTED ON THE BASIS OF THESE PRESCRIPTIONS*/

(Revision 2, including the amendments entered into force on 16 October 1995)

Addendum 108: Regulation No. 109

Date of entry into force: 23 June 1998

UNIFORM PROVISIONS CONCERNING THE APPROVAL FOR THE PRODUCTION OF RETREADED PNEUMATIC TYRES FOR COMMERCIAL VEHICLES AND THEIR TRAILERS

UNITED NATIONS

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*/ Former title of the Agreement:

Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958.

GE.98-23783

Regulation No. 109

UNIFORM PROVISIONS CONCERNING THE APPROVAL FOR THE PRODUCTION OF RETREADED PNEUMATIC TYRES FOR COMMERCIAL VEHICLES AND THEIR TRAILERS

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ANNEXES

Annex 1 - Communication concerning the approval or extension or refusal or withdrawal of approval or production definitely discontinued of a retreading production unit pursuant to Regulation No. 109

Annex 2 - Arrangement of approval mark

Annex 3 - Arrangement of retread tyre markings

Annex 4 - List of load indices and corresponding load capacities

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Appendix 2 - Relationship between the pressure index and units of pressure

Annex 8 - Variation of load capacity with speed: commercial vehicle tyres radial and diagonal ply

Annex 9 - Explanatory figure

1. SCOPE

This Regulation applies to the production of retreaded tyres intended to be fitted to commercial vehicles and their trailers used on the road. It does not however apply to:

1.1. Retreaded tyres for private (passenger) cars and their trailers.

1.2. Retreaded tyres with a speed capability below 80 km/h.

1.3. Tyres for cycles and motorcycles.

1.4. Tyres originally produced without speed symbols and/or load indices.

1.5. Tyres originally produced without type approval and without either an "E" or "e" mark.

2. DEFINITIONS - See also figure in annex 9

For the purpose of this Regulation:

2.1. "Range of retreaded pneumatic tyres" - means a range of retreaded pneumatic tyres as quoted in paragraph 4.1.4.

2.2. "Structure" of a pneumatic-tyre means the technical characteristics of the tyre's carcass. The following structures are distinguished in particular:

2.2.1. "Diagonal" or "Bias ply" describes a pneumatic-tyre structure in which the ply cords extend to the beads and are laid at alternate angles substantially less than 90° to the centreline of the tread.

2.2.2. "Bias belted" describes a pneumatic-tyre structure of diagonal (bias-ply) type in which the carcass is stabilised by a belt, comprising two or more layers of substantially inextensible cord material laid at alternate angles close to those of the carcass.

2.2.3. "Radial" describes a pneumatic-tyre structure in which the ply cords extend to the beads and are laid substantially at 90° to the centreline of the tread, the carcass being stabilised by an essentially inextensible circumferential belt.

2.3. "Category of use"

2.3.1. Normal tyre is a tyre intended for normal road use only.

2.3.2. Special use tyre is a tyre intended for mixed use, both on and off road and/or at restricted speed.

2.3.3. Snow tyre is a tyre whose tread pattern, or tread pattern and structure, is primarily designed to ensure, in mud and fresh or melting snow, a performance better than that of a Normal Tyre. The tread pattern of a snow tyre generally consists of groove (rib) and solid block elements more widely spaced than on a Normal Tyre.

2.4. "Bead" means the part of a pneumatic-tyre which is of such shape and structure as to fit the rim and hold the tyre on it.

2.5. "Cord" means the strands forming the fabric of the plies in the pneumatic-tyre.

2.6. "Ply" means a layer of "rubber" coated parallel cords.

2.7. "Belt" applies to a radial ply or bias belted tyre and means a layer or layers of material or materials underneath the tread, laid substantially in the direction of the centre line of the tread to restrict the carcass in a circumferential direction.

2.8. "Breaker" applies to a diagonal ply tyre and means an intermediate ply between the carcass and tread.

2.9. "Protective breaker" applies to a radial ply tyre and means an optional intermediate ply between the tread and the belt to minimize damage to the belt.

2.10. "Chafer" means material in the bead area to protect the carcass against chafing or abrasion by the wheel rim.

2.11. "Carcass" means that structural part of a pneumatic-tyre other than the tread and outermost "rubber" of the sidewalls which, when inflated, supports the load.

2.12. "Tread" means that part of a pneumatic-tyre which is designed to come into contact with the ground, protects the carcass against mechanical damage and contributes to ground adhesion.

2.13. "Sidewall" means the part of a pneumatic tyre between the tread and the area designed to be covered by the rim flange.

2.14. "Lower area of tyre" means the area included between the line of maximum section width of the tyre and the area designed to be covered by the edge of the rim.

2.15. "Tread groove" means the space between the adjacent ribs or blocks in the tread pattern.

2.16. "Section width" means the linear distance between the outside of the sidewalls of an inflated pneumatic-tyre, when fitted to the specified measuring rim, but excluding elevations due to labelling (marking), decoration or protective bands or ribs.

2.17. "Overall width" means the linear distance between the outside of the sidewalls of an inflated pneumatic-tyre, when fitted to the specified measuring rim, and including labelling (marking), decoration or protective bands or ribs.

2.18. "Section height" means a distance equal to half the difference between the outer diameter of the tyre and the nominal rim diameter.

2.19. "Nominal aspect ratio" means one hundred times the number obtained by dividing the number expressing the nominal section height by the number expressing the nominal section width, both dimensions being in the same units.

2.20. "Outer diameter" means the overall diameter of an inflated, newly retreaded tyre.

2.21. "Tyre size designation" means a designation showing:

2.21.1. The nominal section width. This must be expressed in millimetres, except in cases of tyres for which the size designation is shown in the first column of the tables in annex 5 to this Regulation.

2.21.2. The nominal aspect ratio except in case of tyres for which the size designation is shown in the first column of the tables in annex 5 to this Regulation.

2.21.3. A conventional number "d" (the "d" symbol) denoting the nominal rim diameter of the rim and corresponding to its diameter expressed either by codes (numbers below 100) or in millimetres (numbers above 100). Numbers corresponding to both types of measurements may be used in the designation.

2.21.3 1. The values of the "d" symbols expressed in millimetres are shown below:

Nominal Rim Diameter Code - "d"	Value of the "d" symbol expressed in mm
8	203
9	229
10	254
11	279
12	305
13	330
14	356
15	381
16	406
17	432
18	457
19	483
20	508
21	533
22	559
24	610
25	635
14.5	368
16.5	419
17.5	445
19.5	495
20.5	521
22.5	572
24.5	622
26	660
28	711
30	762

2.22. "Nominal rim diameter (d)" means the diameter of the rim on which a tyre is designed to be mounted.

2.23. "Rim" means the support, either for a tyre-and-tube assembly or for a tubeless tyre, on which the tyre beads are seated.

2.24. "Measuring rim" means the rim specified as a 'measuring rim width' or 'design rim width' for a particular tyre size designation in any edition of one or more of the International Tyre Standards.

2.25. "Test rim" means any rim specified as approved or recommended or permitted in one of the International Tyre Standards for a tyre of that size designation and type.

2.26. "International Tyre Standard" means any one of the following standard documents:

(a) The European Tyre and Rim Technical Organisation (ETRTO) 1/: 'Standards Manual'
(b) The European Tyre and Rim Technical Organisation (ETRTO) 1/: 'Engineering Design Information - obsolete data'
(c) The Tire and Rim Association Inc. (TRA) 2/: 'Year Book'
(d) The Japan Automobile Tire Manufacturers Association (JATMA) 3/: 'Year Book'
(e) The Tyre and Rim Association of Australia (TRAA) 4/: 'Standards Manual'
(f) The Assiciacao Brasileira de Pneus e Aros (ABPA) 5/: 'Manual de Normal Technicas'
(g) The Scandinavian Tyre and Rim Organisation (STRO) 6/: 'Data Book'

2.27. "Chunking" means the breaking away of pieces of rubber from the tread.

2.28. "Cord separation" means the parting of the cords from their rubber coating.

2.29. "Ply separation" means the parting of adjacent plies.

2.30. "Tread separation" means the pulling away of the tread from the carcass.

2.31. "Service description" means the specific combination of the load index and speed symbol of the tyre.

2.32. "Load index" means a numerical code which indicates the load the tyre can carry at the speed corresponding to the associated speed symbol and when operated in conformity with the service conditions specified by the manufacturer. A pneumatic tyre can have more than one load index to indicate its load capacity when used in single or dual (twin) formation, or to indicate an alternative load capacity (Unique point) on which a load variation in accordance with paragraph 2.35. and annex 8 to this Regulation is not permitted.

The tyre standards can be obtained from the following addresses:

1/ ETRTO, 32 Av. Brugmann - Bte 2, B-1060 Brussels, Belgium
2/ TRA, 175 Montrose West Avenue, Suite 150, Copley, Ohio, 44321 USA
3/ JATMA, 9th Floor, Toranomon Building No. 1-12, 1-Chome Toranomon Minato-ku, Tokyo 105, Japan
4/ TRAA, Suite 1, Hawthorn House, 795 Glenferrie Road, Hawthorn, Victoria, 3122 Australia
5/ ABPA, Avenida Paulista 244-12° Andar, CEP, 01310 Sao Paulo, SP Brazil
6/ STRO, Älggatan 48 A, Nb, S-216 15 Malmö, Sweden

The list of load indices and the corresponding loads are shown in annex 4 to this Regulation.

2.33. "Speed symbol" means:

2.33.1. An alphabetical symbol indicating the speed at which the tyre can carry the load given by the associated load index.

2.33.2. The speed symbols and corresponding speeds are as shown in the table below:

Speed symbol	Corresponding maximum speed (km/h)
F	80
G	90
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210

2.34. "Unique point" means an additional service description, marked adjacent to the normal service description, but which must not be used for calculating a load capacity variation as defined in paragraph 2.35. and in annex 8 to this Regulation.

2.35. "Load-capacity variation with speed" means an alternative load capacity for the tyre when used at a speed different from that indicated by the speed symbol in the normal service description. The permissible variations are given in the table in annex 8 to this Regulation.

2.36. "Retreading production unit" means a site or group of localized sites where finished retread tyres are produced.

2.37. "Retreading" means the generic term for reconditioning a used tyre by replacing the worn tread with new material. It may also include renovation of the outermost sidewall surface and replacement of the crown plies or the protective breaker. It covers the following process methods:

2.37.1. "Top capping" - replacement of the tread;

2.37.2. "Re-capping" - replacement of the tread and with the new material extending over part of the sidewall;

2.37.3. "Bead to bead" - replacement of the tread and renovation of the sidewall including all or part of the lower area of the tyre.

2.38. "Casing" is the worn tyre comprising carcass and remaining tread and sidewall material.

2.39. "Buffing" is the process of removing old material from the casing to prepare the surface for the new material.

2.40. "Repair" is the remedial work carried out to damaged casings within recognised limits.

2.41. "Tread material" is a material in a condition suitable for replacing the worn tread. It can be in several forms for example:

2.41.1. "Camel-back" - pre-cut lengths of material which has been extruded to give the required cross section profile and subsequently fitted cold to the prepared casing. The new material must be cured.

2.41.2. "Strip-wound" - a ribbon of tread material which is directly extruded and wound on to the prepared casing and built up to the required cross sectional contour. The new material must be cured.

2.41.3. "Direct extrusion" - tread material extruded to give the required cross sectional profile and directly extruded on to the prepared casing. The new material must be cured.

2.41.4. "Pre-cured" - a previously formed and cured tread applied to the prepared casing. The new material must be bonded to the casing.

2.42. "Sidewall veneer" is a material used to cover the sidewalls of the casing thereby allowing the required markings to be formed.

2.43. "Cushion gum" is a material used as a bonding layer between new tread and casing and for repairing minor damage.

2.44. "Cement" is an adhesive solution to hold new materials in place prior to the curing process.

2.45. "Cure" is the term used to describe the change in physical properties of the new material which is brought about usually by the application of heat and pressure for a set period of time under controlled conditions.

3. MARKINGS

3.1. An example of the arrangement of retreaded tyre markings is shown in annex 3 to this Regulation.

3.2. Retreaded tyres shall display on both sidewalls in the case of symmetrical tyres and at least on the outer sidewall in the case of asymmetrical tyres:

3.2.1. The brand name or trade mark;

3.2.2. The tyre-size designation as defined in paragraph 2.21.;

3.2.3. An indication of the structure as follows:

3.2.3.1. On diagonal (bias-ply) tyres; no indication, or the letter "D" placed in front of the rim diameter marking;

3.2.3.2. On radial-ply tyres; the letter "R" placed in front of the rim-diameter marking and optionally the word "RADIAL";

3.2.3.3. On bias belted tyres; the letter "B" placed in front of the rim diameter marking and in addition the words "BIAS-BELTED";

3.2.4. The service description comprising:

3.2.4.1. An indication of the tyre's nominal load capacity/capacities in the form of the load index/indices prescribed in paragraph 2.32.;

3.2.4.2. An indication of the tyre's nominal speed capability in the form of the symbol prescribed in paragraph 2.33.;

3.2.5. If applicable, one alternative service description, the Unique point, comprising:

3.2.5.1. An indication of the tyre's load capacity/capacities in the form of the load index/indices prescribed in paragraph 2.32.;

3.2.5.2. An indication of the speed capability in the form of the symbol prescribed in paragraph 2.33.;

3.2.6. The word "TUBELESS" if the tyre is designed for use without an inner tube.

3.2.7. The inscription M+S or MS or M.S. or M & S in the case of a snow tyre.

3.2.8. The date of retreading as follows:

3.2.8.1. <u>Up to 31 December 1999:</u> either as prescribed in paragraph 3.2.8.2. or in the form of a group of three digits, the first two showing the week number and the third, the year of the decade of

manufacture. The date code can cover a period of production from the week indicated by the week number up to and including the week number plus three. For example, the marking "253" could indicate a tyre which was retreaded in weeks 25, 26, 27 or 28 of the year 1993.

The date code may be marked on one sidewall only.

3.2.8.2. As from 1 January 2000: in the form of a group of four digits, the first two showing the week number and the second two showing the year in which the tyre was retreaded. The date code can cover a period of production from the week indicated by the week number up to and including the week number plus three. For example, the marking "2503" could indicate a tyre which was retreaded in weeks 25, 26, 27 or 28 of the year 2003.

The date code may be marked on one sidewall only.

3.2.9. In the case of tyres which can be regrooved, the symbol " U " in a circle at least 20 mm diameter, or the word "REGROOVABLE", moulded into or on to each sidewall.

3.2.10. An indication, by the means of the "PSI" index, of the inflation pressure to be adopted for the load/speed endurance tests, as explained in annex 7, appendix 2 to this Regulation.

This indication may be placed on one sidewall only.

3.2.11. The term "RETREAD" or "REMOULD" (after 1 January 1999 only the word "RETREAD" shall be used). At the request of the retreader, the same term in other languages may also be added.

3.3. Prior to approval tyres shall exhibit a free space sufficiently large to accommodate an approval mark as referred to in paragraph 5.8. and as shown in annex 2 to this Regulation.

3.4. Following approval, the markings referred to in paragraph 5.8. and as shown in annex 2 to this Regulation shall be affixed in the free space referred to in paragraph 3.3. This marking may be affixed to one sidewall only.

3.5. The markings referred to in paragraph 3.2. and the approval mark prescribed in paragraphs 3.4. and 5.8. shall be clearly legible and shall be moulded on to or into the tyre or shall be permanently marked on to the tyre.

3.6. As far as any of the original manufacturer's specifications are still legible after the tyres have been retreaded, they shall be regarded as specifications of the retreader for the retreaded tyre. If these original specifications do not apply after retreading they shall be completely removed.

3.7. The original "E" or "e" approval mark and approval number and any other subsequent retreading production unit's approval mark and number, if no longer applicable, shall be removed.

4. APPLICATION FOR APPROVAL

The following procedures are applicable to the approval of a tyre retreading production unit:

4.1. The application for approval of a retreading production unit shall be submitted by the holder of the trade name or trade mark to be applied to the tyre or by his duly accredited representative. It shall specify:

4.1.1. An outline of the structure of the company producing the retreaded tyres.

4.1.2. A brief description of the quality management system, which ensures the effective control of the tyre retreading procedures to meet the requirements of this Regulation.

4.1.3. The trade names or marks to be applied to the retreaded tyres produced.

4.1.4. The following information in relation to the range of tyres to be retreaded:

4.1.4.1. the range of tyre sizes;

4.1.4.2. the structure of tyres (diagonal or bias ply, bias-belted or radial);

4.1.4.3. the category of use of tyres (normal or snow tyres etc.);

4.1.4.4. the system of retreading and the method of application of the new materials to be used, as defined in paragraphs 2.37. and 2.41.;

4.1.4.5. the maximum speed symbol of the tyres to be retreaded;

4.1.4.6. the maximum load index of the tyres to be retreaded;

4.1.4.7. the nominated International Tyre Standard to which the range of tyres conform.

5. APPROVAL

5.1. To retread tyres requires the approval of the retreading production unit by the approval authorities in accordance with the requirements of this Regulation. The approval authority shall take the necessary measures as described in this Regulation in order to

ensure that the tyres retreaded in the respective production unit will meet with the requirements stated in this Regulation. The retread production unit shall be fully responsible for ensuring that the retreaded tyres will meet the requirements of this Regulation and that they will perform adequately in normal use.

5.2. In addition to the normal requirements for the initial assessment of the tyre retreading production unit, the approval authority shall be satisfied that the procedures, operation, instructions and specification documentation provided by material suppliers are in a language readily understood by the tyre retreading production unit operatives.

5.3. The approval authority shall ensure that the procedures and operations documentation for each production unit contains specifications, appropriate to the repair materials and processes used, of the limits of repairable damage or penetrations to the tyre carcass, whether such damage is existing or is caused during the processes of preparation for retreading.

5.4. Before granting approval the authority must be satisfied that retreaded tyres conform to this Regulation and that the tests prescribed in paragraphs 6.5. and 6.6. have been successfully carried out on at least 5 and not necessarily more than 20 samples of retreaded tyres representative of the range of tyres produced by the retreading production unit.

5.5. In the case of each failure being recorded during tests, two further samples of the same specification tyre shall be tested.
If either or both of these second two samples fail, then a final submission of two samples shall be tested.
If either or both of the final two samples fail, then the application for approval of the retreading production unit shall be rejected.

5.6. If all the requirements of this Regulation are met, then approval shall be granted and an approval number shall be assigned to each retreading production unit approved. The first two digits of this number shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The approval number shall be preceded by "109R" signifying that the approval applies to a tyre retreaded as prescribed in this Regulation.

The same authority shall not assign the same number to another production unit covered by this Regulation.

5.7. Notice of approval or of extension, refusal or withdrawal of approval or of production definitely discontinued pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement applying this Regulation, by means of a form conforming to the model in annex 1 to this Regulation.

5.8. There shall be affixed conspicuously to every retreaded tyre conforming to this Regulation, in the space referred to in paragraph 3.3. and in addition to the markings prescribed in paragraph 3.2., an international approval mark consisting of:

5.8.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which granted approval 7/; and

5.8.2. An approval number as described in paragraph 5.6.

5.9. Annex 2 to this Regulation gives an example of the arrangements of the approval mark.

6. REQUIREMENTS

6.1. Tyres shall not be accepted for first retread unless they have been type approved and bear either an "E" or "e" mark, except that this requirement shall not be mandatory until 1 January 2000 at the latest.

6.2. Conditions before retreading:

6.2.1. Tyres shall be clean and dry before inspection.

6.2.2. Before buffing, each tyre shall be thoroughly examined both internally and externally to ensure its suitability for retreading.

6.2.3. Tyres where damage is visible which has resulted from overload or underinflation shall not be retreaded.

6.2.4. Tyres showing any of the following damage shall not be accepted for retreading:

7/ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32-36 (vacant), 37 for Turkey, 38-39 (vacant), 40 for The former Yugoslav Republic of Macedonia, 41 (vacant), 42 for the European Community (Approvals are granted by its Member States using their respective ECE symbol) and 43 for Japan. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

6.2.4.1. General:

(a) non repairable rubber cracking extending through to the carcass
(b) carcass break up
(c) appreciable oil or chemical attack
(d) damaged or broken bead core
(e) previous repairs of damage outside specified injury limits - see paragraph 5.3.

6.2.4.2. Conditions outside specified limits of repairability - see paragraph 5.3:

(a) carcass penetrations or damage after preparation for repair
(b) multiple damage too close together
(c) substantial deterioration of inner liner
(d) bead damage
(e) exposed carcass cords
(f) loose cords
(g) belt ply separation
(h) permanently deformed or kinked (steel) carcass cords
(i) circumferential cracking above the bead
(j) corroded steel cord or bead wire

6.3. Preparation:

6.3.1. After buffing, and before the application of new material, each tyre shall be thoroughly re-examined, at least externally, to ensure its continued suitability for retreading.

6.3.2. The entire surface to which new material is to be applied shall have been prepared without overheating. The buffed surface texture shall not contain deep buffing lacerations or loose material.

6.3.3. Where precured material is to be used the contours of the prepared area shall meet the requirements of the material manufacturer.

6.3.4. Damage caused during buffing must not exceed defined limits of repair, see paragraph 5.3., and must be repaired.

6.3.5. Buffing damage to diagonal ply tyres shall not extend beyond the outermost carcass ply in the crown area. It shall be assumed that the first ply encountered is a carcass ply unless a breaker can be positively identified. If a breaker is fitted, localized damage is permissible.

6.3.6. Localized buffing damage to the belt of radial tyres is permissible. For larger damage it is permissible for the complete belt or sections of the belt to be replaced. Where a protective breaker is fitted, and can be positively identified as such, if it is damaged it is permissible to remove it and it need not be renewed.

6.3.7. Exposed steel parts shall be treated as soon as possible with appropriate material as defined by the manufacturer of that appropriate material.

6.4. Retreading:

6.4.1. The retreader must ensure that either the manufacturer or the supplier of repair materials, including patches, is responsible for the following:

(a) defining method(s) of application and storage, if requested by the retreader, in the national language of the country in which the materials are to be used;

(b) defining limits of damage for which the materials are designed, if requested by the retreader, in the national language of the country in which the materials are to be used;

(c) ensuring that reinforced patches for tyres, if correctly applied in carcass repairs, are suitable for the purpose;

(d) ensuring that the patches are capable of withstanding twice the maximum inflation pressure as given by the tyre manufacturer;

(e) ensuring the suitability of any other repair materials for the service intended.

6.4.2. The retreader shall be responsible for the correct application of the repair material and for ensuring that the repair is free from any defects which may affect the satisfactory service life of the tyre.

6.4.3. The area surrounding a reinforced repair to a sidewall or shoulder of a radial ply tyre may bulge slightly when the tyre is fitted and inflated to the recommended operating pressure. Reinforced repair materials with physical properties that restrict the height of the bulge to not more than 4 mm shall be used.

6.4.4. The retreader shall ensure that either the manufacturer or the supplier of tread and sidewall material issues specifications concerning the conditions of storage and use of the material in order to guarantee the material's qualities. If requested by the retreader, this information shall be in the national language of the country in which the materials are to be used.

6.4.5. The retreader must ensure that the repair material and/or compound is documented in a manufacturer's or supplier's certificate. The material compound must be suitable for the intended use of the tyre.

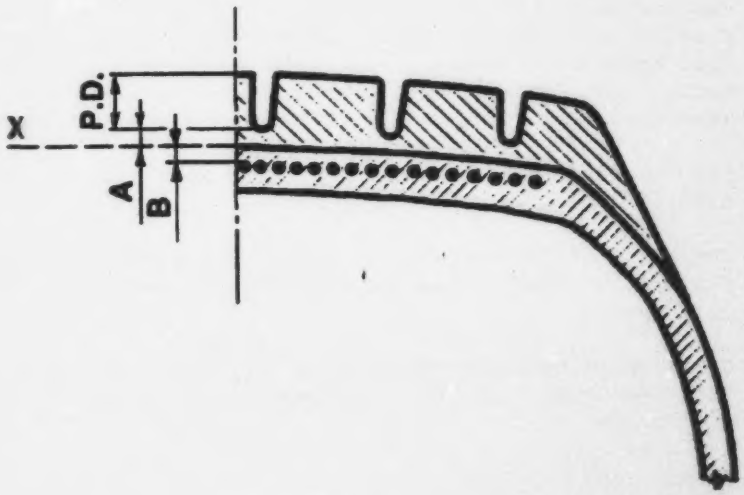
6.4.6. The processed tyre shall be cured as soon as possible after the completion of all repairs and building-up operations and at the latest according to the material manufacturer's specifications.

6.4.7. The tyre shall be cured for the length of time and at the temperature and pressure, appropriate to, and specified for, the materials and processing equipment used. The dimensions of the mould must be appropriate to the thickness of the new material and the size of the buffed tyre.

6.4.8. The thickness of original material after buffing and the average thickness of any new material under the tread pattern after retreading shall be as given in paragraphs 6.4.8.1. and 6.4.8.2.

6.4.8.1. For radial ply tyres (mm):

$3 \leq (A+B) \leq 13$	(minimum 3.0mm; maximum 13.0 mm)
$A \geq 2$	(minimum 2.0 mm)
$B \geq 0$	(minimum 0.0 mm)



P.D. = Pattern depth
X = Buff line
A = Average thickness of new material under pattern
B = Minimum thickness of original material above belt after buffing

6.4.8.2. For diagonal (Bias-ply) tyres:

The thickness of original material above the breaker shall be ≥ 0.80 mm;

The average thickness of new material above the buffed casing line shall be ≥ 2.00 mm;

The combined thickness of original and new material beneath the base of the grooves of the tread pattern shall be ≥ 3.00 mm and ≤ 13.00 mm.

6.4.9. The service description of a retreaded tyre shall not show either a higher speed symbol or a higher load index than that of the original, first life, tyre unless approval has been granted to the manufacturer of the original, first life, tyre for that same carcass to be used at the revised service description.

Information that an original, first life, carcass has been upgraded in this way shall be made freely available by an approval authority to any retreading production unit and shall be communicated to other parties to the 1958 Agreement (see Article 5 of the Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the basis of these Prescriptions - document E/ECE/324-E/ECE/TRANS/505/Rev.2).

The standard form shown in annex 1 to Regulation No. 54 shall be used to communicate this information.

6.4.10. Upgrading of the service description as given in paragraph 6.4.9. shall only be permitted for the first retread of an original, first life tyre.

Tyres which have been previously retreaded shall not have either the speed symbol or the load index raised above that shown on the used casing.

6.5. Inspection:

6.5.1. After curing, whilst a degree of heat is retained in a tyre, each retreaded tyre shall be examined to ensure that it is free from any apparent defects. During or after retreading the tyre must be inflated to at least 1.5 bar for examination. Where there is any apparent defect in the profile of the tyre (e.g. blister, depression, etc.) the tyre shall be specifically examined to determine the cause of this defect.

6.5.2. Before, during or after retreading the tyre shall be checked at least once for the integrity of its structure by means of a suitable inspection method.

6.5.3. For the purposes of quality control a number of retreaded tyres shall be subjected to destructive or non destructive testing or examination. The quantity of tyres checked and the results shall be recorded.

6.5.4. After retreading, the dimensions of the retreaded tyre, when measured in accordance with annex 6 to this Regulation, must conform either to dimensions calculated according to the procedures in paragraph 7 or to those given in annex 5 to this Regulation. Note that the maximum outer diameter of a retreaded tyre may be up to 1.5 per cent greater than the maximum outer diameter of a new, original tyre permitted by Regulation No. 54.

6.6. Performance test:

6.6.1. Tyres retreaded to comply with this Regulation shall be capable of meeting the load/speed endurance test as specified in annex 7 to this Regulation.

6.6.2. A retreaded tyre which after undergoing the load/speed endurance test does not exhibit any tread separation, ply separation, cord separation, chunking or broken cords shall be deemed to have passed the test.

6.6.3. The outer diameter of the tyre, measured six hours after the load/speed endurance test, must not differ by more than ± 3.5 per cent from the outer diameter as measured before the test.

7. SPECIFICATIONS

7.1. Tyres retreaded to comply with this Regulation shall conform to the following dimensions:

7.1.1. Section width:

7.1.1.1. The section width shall be calculated by the following formula:

$$S = S_1 + K\ (A - A_1)$$

where:

S : is the actual section width in millimetres as measured on the test rim;

S_1: is the value of the 'Design Section Width', referred to the measuring rim, as quoted in the International Tyre Standard specified by the retreader for the tyre size in question;

A : is the width of the test rim in millimetres;

A_1: is the width in millimetres of the measuring rim as quoted in the International Tyre Standard specified by the retreader for the tyre size in question.

K : is a factor and shall be taken to equal 0.4.

7.1.2. Outer diameter:

7.1.2.1. The theoretical outer diameter of a retreaded tyre shall be calculated by the following formula:

$D = d + 2H$

where:

D: is the theoretical outer diameter in millimetres;

d: is the conventional number defined in paragraph 2.21.3. in millimetres;

H: is nominal section height in millimetres and is equal to S_n multiplied by 0.01 Ra

where:

S_n: is the nominal section width in millimetres;

Ra: is the nominal aspect ratio.

All of the above symbols are as quoted in the tyre size designation as shown on the sidewall of the tyre in conformity with the requirements of paragraph 3.2.2. and as defined in paragraph 2.21.

7.1.2.2. However, for tyres whose designation is given in the first column of the tables in annex 5 to ECE Regulation No. 54, the outer diameter shall be that given in those tables.

7.1.3. Method of measuring retreaded tyres:

7.1.3.1. The dimensions of retreaded tyres shall be measured in accordance with the procedures given in annex 6 to this Regulation.

7.1.4. Section width specifications:

7.1.4.1. The actual overall width may be less than the section width or widths determined in paragraph 7.1.

7.1.4.2. The actual overall width may also exceed the value or values determined in paragraph 7.1. by:

4 per cent in the case of radial ply tyres and

8 per cent in the case of diagonal (bias-ply) and bias belted tyres.

However, for tyres with a section width exceeding 305 mm, intended for fitting in dual (twin) formation, the nominal value or values shall not be exceeded by more than:

2 per cent in the case of radial ply tyres and

4 per cent for diagonal (bias-ply) and bias belted tyres.

7.1.5. Outer diameter specifications:

7.1.5.1. The actual outer diameter of a retreaded tyre must not be outside the values of Dmin and Dmax obtained by the following formulae:

$$Dmin = d + (2H \times a)$$

$$Dmax = 1.015 \times [d + (2H \times b)]$$

where:

7.1.5.1.1. For sizes not given in the tables in annex 5 to this Regulation, "H" and "d" are as defined in paragraph 7.1.2.1.

7.1.5.1.2. For sizes mentioned in paragraph 7.1.2.2. above:

$$H = 0.5 (D - d)$$

where "D" is the outer diameter and "d" the Nominal rim diameter quoted in the above-mentioned tables for the size in question.

7.1.5.1.3. The coefficient "a" = 0.97

7.1.5.1.4. The coefficient "b" is:

	Radial tyres	Diagonal (bias-ply) and bias belted tyres
for normal use tyres	1.04	1.07
for special use tyres	1.06	1.09

7.1.5.2. For snow tyres the maximum outer diameter (Dmax) calculated in paragraph 7.1.5.1. may be exceeded by not more than 1 per cent.

8. MODIFICATIONS TO THE APPROVAL

8.1. Every modification concerning a retreading production unit amending any of the information given by the retreading production unit in the Application for Approval, see paragraph 4, shall be notified to the approval authority which approved the retreading production unit. That authority may then either:

8.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the retreading production unit still meets the requirements; or

8.1.2. Require a further investigation of the approval.

8.2. Confirmation of, or refusal of, approval, specifying the modifications, shall be communicated by the procedure specified in

paragraph 5.7. to the Parties to the Agreement which apply this Regulation.

9. CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the Agreement, Appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.2), with the following requirements:

9.1. The retreading production unit approved according to this Regulation shall conform to the requirements set out in paragraph 6.

9.2. The holder of the approval shall ensure that, during each year of production, and spread throughout that year, at least the following number of tyres, representative of the range being produced, is checked and tested as prescribed in this Regulation:

9.2.1. 0.01 per cent of the total annual production but in any case not less than 2 and not necessarily more than 10.

9.3. If the requirements of paragraph 9.2. are carried out by or under the control of the approval authority, the results may be used as part of, or instead of, those prescribed in paragraph 9.4.

9.4. The authority which has approved the retreading production unit may at any time verify the conformity control methods applied in each production facility. For each production facility, the type approval authority shall take samples at random during each and every production year and at least the following number of tyres, representative of the range being produced, shall be checked and tested as prescribed in this Regulation:

9.4.1. 0.01 per cent of the total annual production but in any case not less than 2 and not necessarily more than 10.

9.5. The tests and checks of paragraph 9.4. may replace those required in paragraph 9.2.

10. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

10.1. The approval granted in respect of a retreading production unit pursuant to this Regulation may be withdrawn if the requirements of paragraph 9 are not complied with or if the retreading production unit or the retreaded tyres produced by that retreading production unit have failed to meet the requirements prescribed in paragraph 9.

10.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties to the 1958 Agreement applying this Regulation, by means of a communication form conforming to the model shown in annex 1 to this Regulation.

11. PRODUCTION DEFINITELY DISCONTINUED

The authority which granted the approval of the retreading production unit shall be informed if operations and manufacture of retreaded tyres approved within the scope of this Regulation cease. On receipt of this information the authority shall communicate this information to the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model shown in annex 1 to this Regulation.

12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, OF TEST LABORATORIES, AND OF ADMINISTRATIVE DEPARTMENTS

12.1. The Parties to the 1958 Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and, where applicable, of the approved test laboratories and of the administrative departments which grant approval and to which forms certifying approval or refusal or withdrawal of approval or production definitely discontinued, issued in other countries, are to be sent.

12.2. The Parties to the 1958 Agreement which apply this Regulation may use laboratories of tyre manufacturers or retreading production units and may designate, as approved test laboratories, those which are situated either in the territory of that Party or in the territory of another Party to the 1958 Agreement subject to a preliminary acceptance of this procedure by the competent administrative department of the latter.

12.3. Where a Party to the 1958 Agreement applies paragraph 12.2., it may, if it so desires, be represented at the tests.

Annex 1

COMMUNICATION

(maximum format: A4 (210 x 297 mm))

issued by: Name of administration:
.....
.....
.....

concerning: 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a retreading production unit pursuant to Regulation No. 109

Approval No.: ..... Extension No.:.....

1. Retreader's name or trade mark: . . . . . .

2. Name and address of retreading production unit: . . . . . .
. . . . . .

3. If applicable, name and address of retreader's representative: . . . .
. . . . . .

4. Summarized description as in paragraphs 4.1.3. and 4.1.4. of this Regulation: . . . . . .

5. Technical service and, where applicable, test laboratory approved for purposes of approval or verification of conformity: . . . . . .
. . . . . .

6. Date of report issued by that service: . . . . . .

7. Number of report issued by that service: . . . . . .

8. Reason(s) of extension (if applicable): . . . . . .

9. Any remarks: . . . . . .

10. Place: . . . . . .

11. Date: . . . . . .

12. Signature . . . . . .

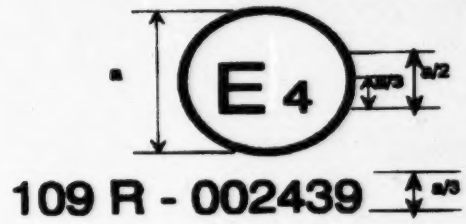
13. Annexed to this communication is a list of documents in the approval file deposited at the Approval Authority which has considered this approval and which can be obtained upon request.

1/ Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).

2/ Delete that which does not apply.

Annex 2

ARRANGEMENT OF APPROVAL MARK



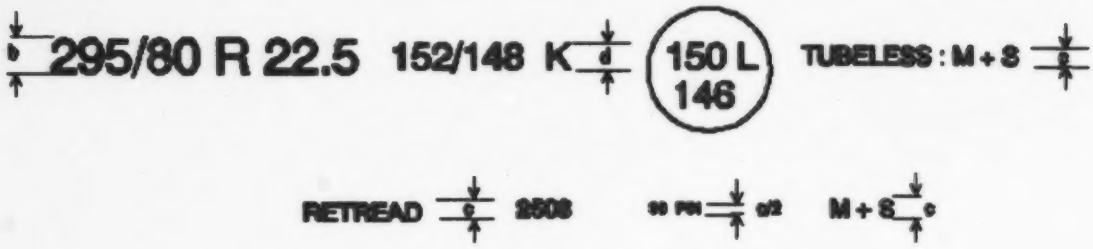
a = 12 mm min

The above approval mark affixed to a retreaded tyre shows that the retreading production unit concerned has been approved in the Netherlands (E4) under approval number 109R002439 meeting the requirements of this Regulation in its original form (00).

The approval number must be placed close to the circle and either above or below the "E" or left or right of that letter. The digits of the approval number must be on the same side of the "E" and face in the same direction. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

Annex 3

ARRANGEMENT OF RETREAD TYRE MARKINGS



	MINIMUM HEIGHTS OF MARKINGS (mm)	
	Tyres of rim diameter ≤ code 20 or ≤ 508 mm or of section width ≤ 235 mm or ≤ 9"	Tyres of rim diameter > code 20 or > 508 mm or of section width > 235 mm or > 9"
b	6	9
c	4	
d	6	

The above example defines a retreaded pneumatic tyre:

Having a nominal section width of 295;

Having a nominal aspect ratio of 80;

Of radial-ply structure (R);

Having a nominal rim diameter of 572 mm, for which the code is 22.5;

Having load capacities of 3550 kg (single) and 3150 kg (twinned or dual), corresponding respectively to the load indices 152 and 148 shown in annex 4 to this Regulation;

Having a nominal speed symbol K (reference speed 110 km/h);

Able to be used at the Unique Point, speed symbol L (reference speed 120 km/h); with a load capacity of 3350 kg (single) and 3000 kg (twinned or dual), corresponding respectively to the load indices 150 and 146 shown in annex 4 to this Regulation;

Intended to be used without an inner tube ("TUBELESS") and of Snow type (M+S);

Retreaded in the weeks 25, 26, 27 or 28 of the year 2003.

Requiring to be inflated to 620 kPa for load/speed endurance tests, for which the PSI symbol is 90.

The positioning and order of the markings constituting the tyre designation shall be as follows:

(a) The size designation, comprising the nominal section width, the nominal aspect ratio, the type-of-structure symbol (where applicable) and the nominal rim diameter, shall be grouped as shown in the above example, that is: 295/80 R 22,5;

(b) The service description, comprising the load indices and the speed symbol shall be placed together near the size designation. It may either precede the size designation or follow it or be placed above or below it;

(c) The symbol "TUBELESS" and "M+S" may be at a distance from the size-designation symbol.

(d) The word "RETREAD" may be at a distance from the size-designation symbol.

(e) If paragraph 3.2.5. of this Regulation is applied, the additional service description (Unique Point), comprising the load indices and speed symbol, must be shown inside a circle near the nominal service description appearing on the tyre sidewall.

Annex 4

LIST OF LOAD INDICES AND CORRESPONDING LOAD CAPACITIES

Load index (LI) and load capacity - kg													
LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg
0	45	40	140	80	450	120	1 400	160	4 500	200	14 000	240	45 000
1	46.2	41	145	81	462	121	1 450	161	4 625	201	14 500	241	46 250
2	47.5	42	150	82	475	122	1 500	162	4 750	202	15 000	242	47 500
3	48.7	43	155	83	487	123	1 550	163	4 875	203	15 500	243	48 750
4	50	44	160	84	500	124	1 600	164	5 000	204	16 000	244	50 000
5	51.5	45	165	85	515	125	1 650	165	5 150	205	16 500	245	51 500
6	53	46	170	86	530	126	1 700	166	5 300	206	17 000	246	53 000
7	54.5	47	175	87	545	127	1 750	167	5 450	207	17 500	247	54 500
8	56	48	180	88	560	128	1 800	168	5 600	208	18 000	248	56 000
9	58	49	185	89	580	129	1 850	169	5 800	209	18 500	249	58 000
10	60	50	190	90	600	130	1 900	170	6 000	210	19 000	250	60 000
11	61.5	51	195	91	615	131	1 950	171	6 150	211	19 500	251	61 500
12	63	52	200	92	630	132	2 000	172	6 300	212	20 000	252	63 000
13	65	53	206	93	650	133	2 060	173	6 500	213	20 600	253	65 000
14	67	54	212	94	670	134	2 120	174	6 700	214	21 200	254	67 000
15	69	55	218	95	690	135	2 180	175	6 900	215	21 800	255	69 000
16	71	56	224	96	710	136	2 240	176	7 100	216	22 400	256	71 000
17	73	57	230	97	730	137	2 300	177	7 300	217	23 000	257	73 000
18	75	58	236	98	750	138	2 360	178	7 500	218	23 600	258	75 000
19	77.5	59	243	99	775	139	2 430	179	7 750	219	24 300	259	77 500
20	80	60	250	100	800	140	2 500	180	8 000	220	25 000	260	80 000
21	82.5	61	257	101	825	141	2 575	181	8 250	221	25 750	261	82 500
22	85	62	265	102	850	142	2 650	182	8 500	222	26 500	262	85 000
23	87.5	63	272	103	875	143	2 725	183	8 750	223	27 250	263	87 500
24	90	64	280	104	900	144	2 800	184	9 000	224	28 000	264	90 000
25	92.5	65	290	105	925	145	2 900	185	9 250	225	29 000	265	92 500
26	95	66	300	106	950	146	3 000	186	9 500	226	30 000	266	95 000
27	97.5	67	307	107	975	147	3 075	187	9 750	227	30 750	267	97 500
28	100	68	315	108	1 000	148	3 150	188	10 000	228	31 500	268	100 000
29	103	69	325	109	1 030	149	3 250	189	10 300	229	32 500	269	103 000
30	106	70	335	110	1 060	150	3 350	190	10 600	230	33 500	270	106 000
31	109	71	345	111	1 090	151	3 450	191	10 900	231	34 500	271	109 000
32	112	72	355	112	1 120	152	3 550	192	11 200	232	35 500	272	112 000
33	115	73	365	113	1 150	153	3 650	193	11 500	233	36 500	273	115 000
34	118	74	375	114	1 180	154	3 750	194	11 800	234	37 500	274	118 000
35	121	75	387	115	1 215	155	3 875	195	12 150	235	38 750	275	121 500
36	125	76	400	116	1 250	156	4 000	196	12 500	236	40 000	276	125 000
37	128	77	412	117	1 285	157	4 125	197	12 850	237	41 250	277	128 500
38	132	78	425	118	1 320	158	4 250	198	13 200	238	42 500	278	132 000
39	136	79	437	119	1 360	159	4 375	199	13 600	239	43 750	279	136 000

Annex 5

TYRE SIZE DESIGNATION AND DIMENSIONS

(IN ACCORDANCE WITH ECE REGULATION No. 54)

FOR THIS INFORMATION REFER TO ANNEX 5 OF ECE REGULATION No. 54

Note that with reference to paragraph 6.5.4. of this Regulation, the outer diameter of a retreaded tyre may in all cases be greater than that shown in the tables in annex 5 to Regulation No. 54 but by no more than 1.5 per cent.

Annex 6

METHOD OF MEASURING PNEUMATIC TYRES

1. The tyre shall be mounted on the test rim specified by the retreader and inflated to the pressure of 3 to 3.5 bar.

2. The tyre, fitted to the appropriate rim, shall be conditioned to the ambient temperature of the laboratory for at least 24 hr save as otherwise required by paragraph 6.6.3. of this Regulation.

3. The pressure shall be re-adjusted to the value in paragraph 1 of this annex.

4. The overall width shall be measured at six equally spaced points around the tyre, taking account of the thickness of any protective ribs or bands. The highest reading obtained shall be taken as the overall width.

5. The outer diameter shall be calculated from a measurement of the maximum circumference of the inflated tyre.

Annex 7

PROCEDURE FOR LOAD/SPEED ENDURANCE TESTS (IN PRINCIPLE IN ACCORDANCE WITH REGULATION No. 54)

1. Preparing the tyre

1.1. Mount a retreaded tyre on the test rim specified by the retreader.

1.2. Use a new inner tube or combination of inner tube, valve and flap (as required) when testing tyres with inner tubes.

1.3. Inflate the tyre to the pressure corresponding to the pressure index as specified in paragraph 3.2.10. of this Regulation.

1.4. Condition the tyre and wheel assembly at test-room temperature for not less than 3 hr.

1.5. Readjust the tyre pressure to that specified in paragraph 1.3. of this annex.

2. Test Procedure

2.1. Mount the tyre and wheel assembly on the test axle and press it against the outer face of a smooth surfaced power-driven test drum 1.70 m ± 1 per cent diameter having a surface at least as wide as the tyre tread. In certain cases a 2.00 m ± 1 per cent diameter drum may be used.

2.2. Apply to the test axle a series of test loads equal to a percentage of the load indicated in annex 4 to this Regulation, corresponding to the load index indicated on the tyre, and in accordance with the test programme below. Where the tyre has load capacity indices for operation in both single and twin or dual formation the load corresponding to the load index for single operation shall be used for the test.

2.2.1. In the case of a tyre with a load index ≤ 121 and a speed symbol ≥ Q (160 km/h), the test procedure shall be as specified in paragraph 3 of this annex.

2.2.2. For all other tyres the test procedure is as shown in appendix 1 to this annex.

2.3. Endurance Test Programme - See also appendix 1 to this annex.

2.3.1. The tyre pressure shall not be corrected throughout the test and the test load shall be kept constant throughout each of the three test stages.

2.3.2. During the test the temperature of the test room shall be maintained at between 20°C and 30°C unless the tyre manufacturer or retreader agrees to the use of a higher temperature.

2.4. The endurance test programme shall be carried out without interruption.

3. Load/Speed test procedure for tyres with a load index ≤ 121 and a speed symbol ≥ Q (160 km/h):

3.1. The load on the wheel and tyre shall be the following percentage of that corresponding to the load index of the tyre:

3.1.1. 90 per cent when tested on a drum of 1.70 m ± 1 per cent diameter;

3.1.2. 92 per cent when tested on a drum of 2.00 m ± 1 per cent diameter.

3.2. The initial phase test speed shall be 20 km/h less than that indicated by the speed symbol for the tyre.

3.2.1. Time taken to reach initial test speed shall be 10 min.

3.2.2. The duration of the first phase shall be 10 min.

3.3. The second phase test speed shall be 10 km/h less than that indicated by the speed symbol for the tyre.

3.3.1. The duration of the second phase shall be 10 min.

3.4. The final phase test speed shall be the speed corresponding to that indicated by the speed symbol for the tyre.

3.4.1. The duration of the final phase shall be 30 min.

3.5. The duration of the entire test shall be 1 hr.

4. Equivalent test method:

If a test method other than that given in paragraphs 2 or 3 of this annex is used, its equivalence must be demonstrated.

Annex 7 - Appendix 1

ENDURANCE-TEST PROGRAMME

Load index	Speed symbol	Test-drum speed [min^{-1}]		Load placed on the wheel as a percentage of the load corresponding to the load index		
		Radial-ply	Diagonal (bias ply) and bias belted	7 h.	16 h.	24 h.
122 or more	F	100	100	66%	84%	101%
	G	125	100			
	J	150	125			
	K	175	150			
	L	200	-			
	M	225	-			
121 or less	F	100	100			
	G	125	125			
	J	150	150			
	K	175	175			
	L	200	175	70%	88%	106%
				4 h.	6 h.	
	M	250	200	75%	97%	114%
	N	275	-	75%	97%	114%
	P	300	-	75%	97%	114%

Notes:

(1) "Special-use" tyres (see paragraph 2.3.2. of this Regulation) shall be tested at a speed equal to 85 per cent of the speed prescribed for equivalent normal tyres.

Annex 7 - Appendix 2

RELATIONSHIP BETWEEN THE PRESSURE INDEX AND UNITS OF PRESSURE

Pressure Index ("PSI")	bar	kPa
20	1.4	140
25	1.7	170
30	2.1	210
35	2.4	240
40	2.8	280
45	3.1	310
50	3.4	340
55	3.8	380
60	4.1	410
65	4.5	450
70	4.8	480
75	5.2	520
80	5.5	550
85	5.9	590
90	6.2	620
95	6.6	660
100	6.9	690
105	7.2	720
110	7.6	760
115	7.9	790
120	8.3	830
125	8.6	860
130	9.0	900
135	9.3	930
140	9.7	970
145	10.0	1000
150	10.3	1030
...	...	...

Annex 8

VARIATION OF LOAD CAPACITY WITH SPEED: COMMERCIAL VEHICLE TYRES
RADIAL AND DIAGONAL PLY
(IN ACCORDANCE WITH UN ECE REGULATION No. 54)

Speed (km/h)	Variation of Load Capacity (%)									
	All load indices				Load indices ≥ 122 5/		Load indices ≤ 121 5/			
	Speed Symbol				Speed Symbol		Speed Symbol			
	F	G	J	K	L	M	L	M	N	P 6/
0	+150	+150	+150	+150	+150	+150	+110	+110	+110	+110
5	+110	+110	+110	+110	+110	+110	+ 90	+ 90	+ 90	+ 90
10	+ 80	+ 80	+ 80	+ 80	+ 80	+ 80	+ 75	+ 75	+ 75	+ 75
15	+ 65	+ 65	+ 65	+ 65	+ 65	+ 65	+ 60	+ 60	+ 60	+ 60
20	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50
25	+ 35	+ 35	+ 35	+ 35	+ 35	+ 35	+ 42	+ 42	+ 42	+ 42
30	+ 25	+ 25	+ 25	+ 25	+ 25	+ 25	+ 35	+ 35	+ 35	+ 35
35	+ 19	+ 19	+ 19	+ 19	+ 19	+ 19	+ 29	+ 29	+ 29	+ 29
40	+ 15	+ 15	+ 15	+ 15	+ 15	+ 15	+ 25	+ 25	+ 25	+ 25
45	+ 13	+ 13	+ 13	+ 13	+ 13	+ 13	+ 22	+ 22	+ 22	+ 22
50	+ 12	+ 12	+ 12	+ 12	+ 12	+ 12	+ 20	+ 20	+ 20	+ 20
55	+ 11	+ 11	+ 11	+ 11	+ 11	+ 11	+17.5	+17.5	+17.5	+17.5
60	+ 10	+ 10	+ 10	+ 10	+ 10	+ 10	+15.0	+15.0	+15.0	+15.0
65	+7.5	+ 8.5	+8.5	+8.5	+8.5	+ 8.5	+13.5	+13.5	+13.5	+13.5
70	+5.0	+7.0	+7.0	+7.0	+7.0	+7.0	+12.5	+12.5	+12.5	+12.5
75	+2.5	+5.5	+5.5	+5.5	+5.5	+5.5	+11.0	+11.0	+11.0	+11.0
80	0	+4.0	+4.0	+4.0	+4.0	+4.0	+10.0	+10.0	+10.0	+10.0
85	-3	+2.0	+3.0	+3.0	+3.0	+3.0	+8.5	+8.5	+8.5	+8.5
90	-6	0	+2.0	+2.0	+2.0	+2.0	+7.5	+7.5	+7.5	+7.5
95	-10	-2.5	+1.0	+1.0	+1.0	+1.0	+6.5	+6.5	+6.5	+6.5
100	-15	-5	0	0	0	0	+5.0	+5.0	+5.0	+5.0
105		-8	-2	0	0	0	+3.75	+3.75	+3.75	+3.75
110		-13	-4	0	0	0	+2.5	+2.5	+2.5	+2.5
115			-7	-3	0	0	+1.25	+1.25	+1.25	+1.25
120			-12	-7	0	0	0	0	0	0
125						0	-2.5	0	0	0
130						0	-5.0	0	0	0
135							-7.5	-2.5	0	0
140							-10	-5	0	0
145								-7.5	-2.5	0
150								-10.0	-5.0	0
155									-7.5	-2.5
160									-10.0	-5.0

5/ The load indices refer to operation in single formation.
6/ Load variations are not allowed for speeds above 160 km/h. For speed symbols "Q" and above the speed corresponding to the speed symbol specifies the maximum permissible speed for the tyre.

EXPLANATORY FIGURE

See paragraph 2 of this Regulation